Percutaneous Transhepatic Bile Drainage

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Percutaneous transhepatic bile drainage was performed in 13 patients with obstructive jaundice, using a combination of the PTC technique and a Seldinger angiography catheter. In 11 cases, the outflow of bile through the catheter was satisfactory and complications were few. Since the risk of the procedure is low and it can be done without laparotomy, it is an ideal technic for biliary decompression before attempting to do a resection. Also, repeated cholangiography through a catheter which is left in place is helpful as a diagnostic aid before and after surgery.

THE RISK OF SURGERY on icteric patients with cancer of the extrahepatic bile duct or pancreas is quite high[1]; it may be reduced by establishing preoperative bile drainage as a preliminary procedure. Cholecystocutaneostomy, cholecysto-jejunostomy, the transhepatic drainage procedure of Rodney Smith and T-tube or Nelatone tube drainage of the common bile duct are then the procedures of choice.

However, these procedures cannot be applied if the tumor obstructing the biliary duct system is located close to the liver; then adequate biliary decompression can only be obtained by transhepatic catheterization of an intrahepatic bile duct. If done during laparotomy,[2] even if feasible, the adhesions that then develop may make subsequent radical resection more hazardous to perform. Hence bile drainage of an intrahepatic bile duct, without resorting to laparotomy, would be the preferred procedure.

Percutaneous transhepatic cholangiography (PTC) has been shown to be a useful method for establishing the cause of an obstructive jaundice. Its technic is well established and can now be carried out safely. Using the PTC technique, percutaneous transhepatic bile duct cannulation has also been instituted as a drainage procedure. Here we describe the technique we used to decompress the biliary system and the results we obtained with it.

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Method

Percutaneous transhepatic bile drainage was performed on 13 icteric patients with cancer of an extrahepatic bile duct or head of the pancreas. At first, each patient underwent percutaneous transhepatic cholangiography. Using a lateral approach a No. 23 gauge needle was introduced through the liver into an intrahepatic bile duct to obtain a cholangiogram. Then the needle was removed and a No. 18 gauge, 13 cm long needle with an overlying thin wall polyethylene catheter (Elaster needle, Hakko Co.) was inserted either in the same direction into one of the right intrahepatic bile duct branches, or using a frontal approach and under fluoroscopical control into one of the intrahepatic bile ducts of the left lobe of the liver as previously described by Takada.[7] After obtaining bile, the needle is withdrawn but the catheter retained. Then a narrow guide wire used for arterial angiography is introduced into the bile duct through the catheter. After ascertaining that the tip of the guide wire is positioned in one of the larger bile ducts at a suitable distance from its entry into the bile duct, the catheter is withdrawn and a Seldinger catheter with several side holes at the tip (Kifa green standard, 2.39 mm in outer diameter, 1.22 mm in inner diameter) is introduced over the guide wire. Then the guide wire is withdrawn and after further advancing

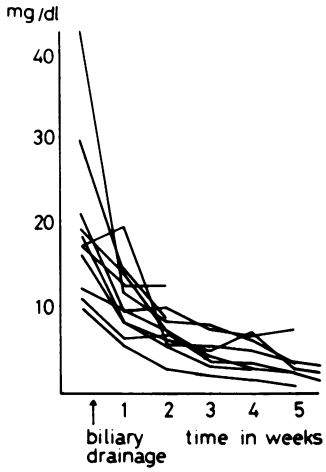

FIG. 1. Total bilirubin concentrations in serum of the patients after percutaneous transhepatic bile drainage.

the Seldinger catheter it is fixed to the skin with a silk suture.

Results

Percutaneous transhepatic bile drainage was performed in thirteen patients with biliary obstruction due to cancer. In 11 patients, satisfactory external bile drainage was obtained. Maximum volume of bile outflow reached 1,400 ml per day. The decline in serum bilirubin concentration following this procedure (in these 11 patients) is shown in Fig. 1, and that of the alkaline-phosphatase in Fig. 2. The serum bilirubin concentration decreased to less than 10 mg/deciliter (dl) within 3 weeks. In some instances, radical resections were performed and the catheter was left in place postoperatively for one to two weeks to allow for continued bile drainage and to protect the site of the biliary anastomosis. The catheter was withdrawn only after we had established that no leakage of bile occurred at the site of the anastomosis.

In instances where radical resection and creation of internal bile drainage could not be established during laparotomy, percutaneous transhepatic bile drainage was continued as a permanent form of biliary decompression by leaving the catheter in place (Fig. 6). In addition to draining the bile, the catheter remained useful as an aid in diagnosis, because cholangiography could be repeated through it.

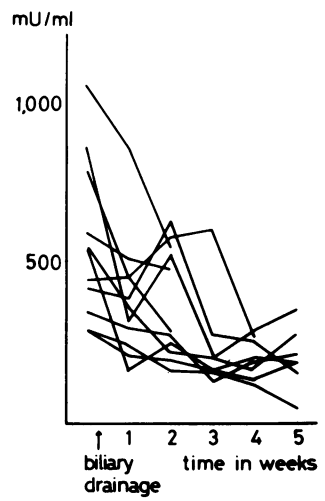

FIG. 2. Alkaline phosphatase in serum of the patients after percutaneous transhepatic bile drainage.

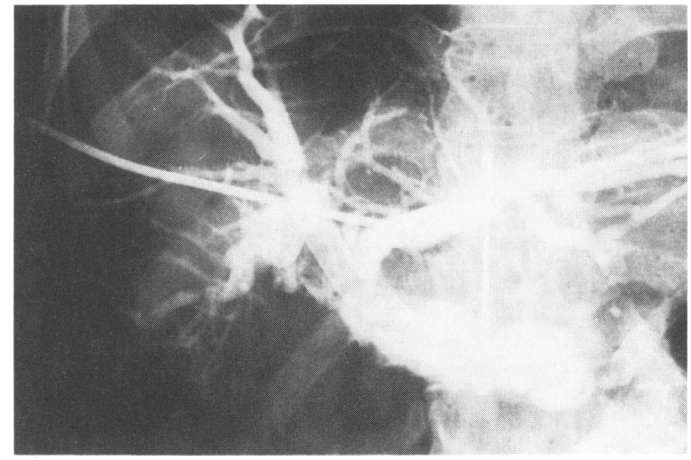

FIG. 3. Cancer of the head of the pancreas (Case 1). Percutaneous transhepatic bile drainage via the frontal approach is continued after pancreatoduodenectomy.

The complications of the procedure were the same as for PTC. Bleeding through the catheter was seen several hours after catheterization in two patients of the 13 treated in this manner. Both were far advanced cases with pronounced icterus. In these two instances the catheter was clamped and left in place for several days. However, clamping the catheter for hemostasis for a long time may lead to hepatic failure or development of hepatorenal syndrome. Therefore we now feel that in those instances other attempts should be made to obtain bile drainage with this same technique but using a different site or alternatively by means of an operative procedure. One of the two patients who bled died 3 days after the procedure, probably because we failed to do this.

Although slight leaking of contrast medium into the abdominal cavity along the catheter was occasionally observed, local or generalized peritonitis did not develop.

Case Reports

Case 1. A 65-year-old woman entered the hospital with jaundice and diabetes mellitus. Following percutaneous transhepatic bile drainage total serum bilirubin concentration fell from 10 mg/dl to 1.2 mg/dl. Pancreatoduodenectomy was performed for cancer of pancreatic head. Figure 3 shows the site of the choledocho-jejunostomy as demonstrated after injecting contrast medium through the catheter. No leakage was seen, therefore the catheter was withdrawn.

Case 2. In a 66-year-old man with a hepatoma which was located to the right of the liver hilum, bile drainage was obtained from a bile duct in the left liver lobe. Bile drainage of the right lobe of the

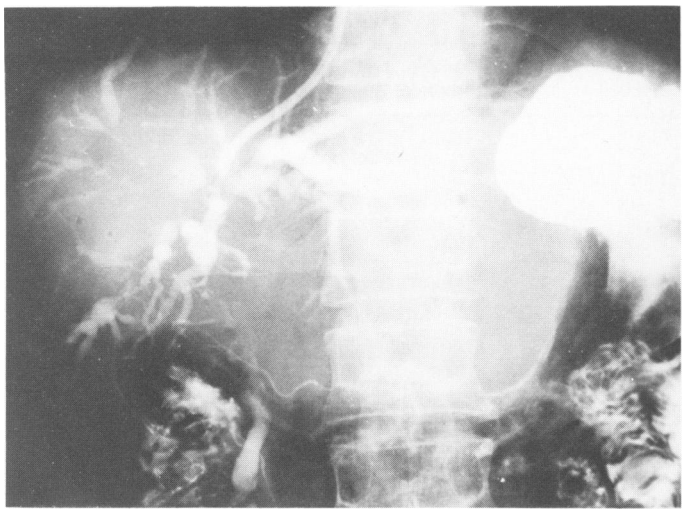

FIG. 4. Hepatoma (Case 2). The hepato-gastrostomy is visualized by injecting contrast media through the drainage catheter.

liver was probably inadequate due to possible blockage of the biliary junction by the tumor. This may explain why the decline in total bilirubin concentration 3 weeks after instituting bile drainage was not sufficient to allow us to do a major resection. Therefore hepatogastrostomy was done instead. Figure 4 shows the contrast media injected through the catheter pass from the intrahepatic bile duct into the stomach.

Case 3. A 65-year-old woman entered the hospital with abdominal pains and a right upper quadrant mass. A colloidal ^{189}Au scintigram showed a cold area at the hilum of the liver. Plasma samples were negative for alpha fetoproteins. The first PTC showed an obstruction at the hilum of the liver and a cancer of the common bile duct was suspected. Percutaneous transhepatic bile drainage was performed and cholangiography was done repeatedly through the catheter at intervals of one week apart. Stagnant intrahepatic bile was eliminated following which the contrast media could be made to pass through the site of the original obstruction (Fig. 5). The cause of the obstruction was diagnosed as being an external compression by a cancer of the gallbladder.

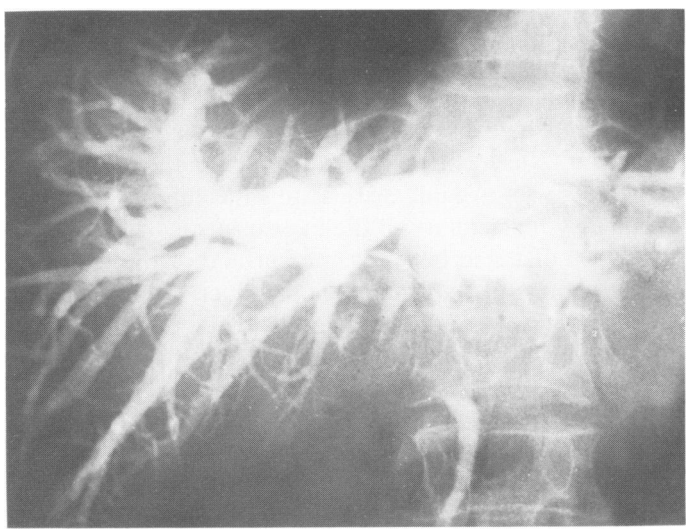

FIG. 5. Cancer of gall bladder (Case 3). Repeated cholangiography via the drainage catheter inserted by a lateral approach revealed the diagnosis.

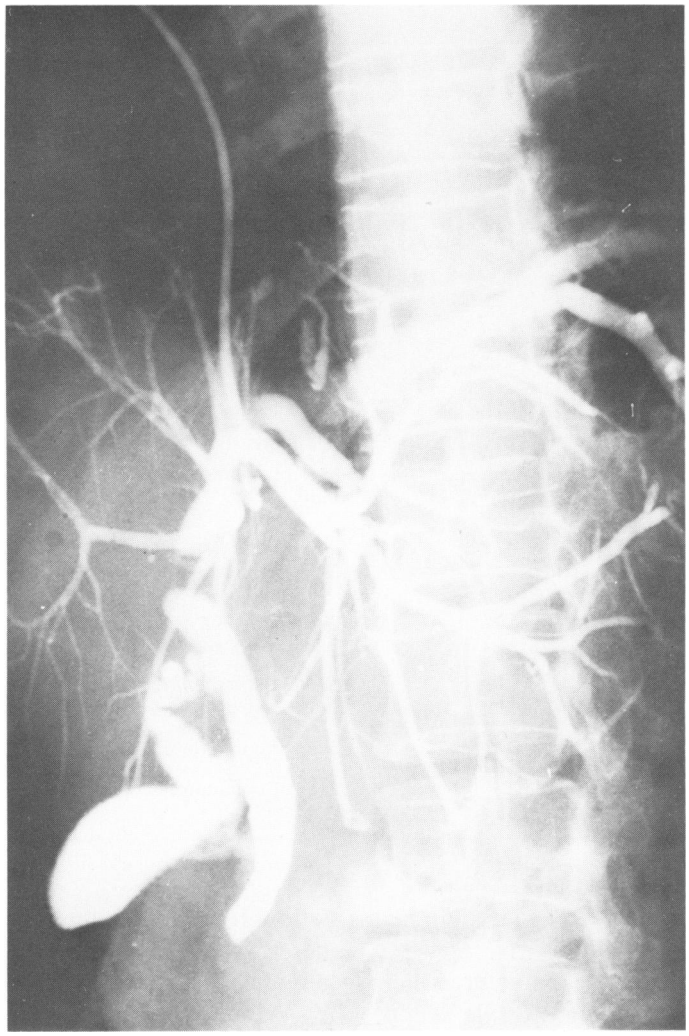

FIG. 6. Inoperable case of choledochus cancer. The drainage catheter inserted in frontal approach was left in place for biliary decompression after exploratory laparotomy.

Case 4. A 72-year-old man entered the hospital because of jaundice lasting for one month. Total serum bilirubin concentration was 33.9 mg/dl and alkaline phosphatase was 210 mU/ml. GOT and GPT was 80 and 34 respectively. There was no hemorrhagic diathesis. PTC revealed a cancer of the common bile duct. Thirty minutes after percutaneous transhepatic bile drainage, bile drainage became bloody followed by a shaking chill and rise in temperature up to 39°. Although the next day the bleeding had stopped, the blood pressure began to fall. Two days later, again blood was seen coming from the drainage tube. It was clamped again. Subsequent cholangiogram showed a clot in the intrahepatic bile duct which interfered with bile flow. As bile flow decreased so did the urine output. Three days after the drainage procedure, the patient died of hepatorenal syndrome.

Discussion

The procedure described here for biliary decompression consists of three steps: 1) diagnostic PTC; 2) insertion

TABLE 1. *Patient Data*

Case No.	Name	Diagnosis	Drainage Effect	Complications	Operation
1	M.K.	Cancer of pancreas head	Good	None	Pancreatoduodenectomy
2	S.K.	Hepatoma of right liver lobe close to liver hilus	Fair	None	Hepatogastrostomy
3	I.H.	Cancer of gall bladder	Good	None	Resection
4	O.M.	Cancer of common bile duct	Poor	Hemorrhage	Not operated, died of hepato-renal syndrome
5	I.K.	Cancer of common bile duct	Good	Hemorrhage temporary	Laparotomy only
6	M.H.	Metastatic tumor at liver hilus from gastric cancer	Good	None	Not operated
7	A.S.	Cancer of common hepatic duct	Good	None	Hepatogastrostomy
8	K.Y.	Cancer of common bile duct	Good	None	Laparotomy only
9	N.I.	Cancer of pancreas head	Good	None	Pancreatoduodenectomy
10	K.S.	Metastatic tumor at liver hilus from gastric cancer	Fair	None	Not operated
11	K.M.	Cancer of common hepatic duct	Good	None	Awaiting a radical section
12	K.M.	Cancer of common bile duct	Good	None	Choledochojejunostomy
13	A.S.	Cancer of common bile duct	Percutaneous transhepatic drainage failed and drainage was instituted by laparotomy. Subsequently a pancreatoduodenectomy was done.		

of a catheter large enough to allow for the introduction of a guide wire; 3) the catheter is exchanged for a Seldinger catheter which is advanced further towards the common bile duct. The second step could be omitted; however, then a large needle would have to be used for PTC in order to be able to pass a Seldinger catheter. The danger of causing serious damage to the liver with such a large needle if repeated punctures are required makes this less desirable particularly if there is associated cirrhosis of the liver.

Bile drainage can be obtained via the polyethylene catheter used in step two, after leaving it in place. In fact Remolar and others[3,5,6] used such a tube supported by a needle to avoid trauma to the liver during PTC and then applied it for bile drainage. However, we found that a polyethylene cathether does not have enough flexibility, consequently it has the tendency to hit the back wall of the bile duct at a right angle, which makes it difficult or impossible to advance it further toward the common bile duct. If the catheter cannot be sufficiently advanced into the bile duct, it usually slips out as the patient moves or breathes. This problem can be simply remedied by using a Seldinger catheter. With this too, however, the patient's movements should be limited. Another problem encountered with the use of a polyethylene catheter is that even if bile drainage is obtained with it, its tip tends to become blocked as the distended bile duct gradually narrows following decompression. Hence, for long-term drainage, a catheter is needed that can be threaded further into the bile ducts. Obata[4] introduced a vinyl tube through the polyethylene catheter, which was inserted over a needle 2 mm in diameter and 16 cm in length, following preliminary PTC.

In our cases a flexible but firmer tube such as a Seldinger catheter was introduced in a manner similar to that used in angiography. In some instances exchanging the catheter, using the lateral approach was initially unsuccessful. Insertion of the Seldinger catheter into the bile duct over a guide wire using the lateral approach is not easy, particularly if the liver tissue is firm, as there is quite a distance between the surface of the liver and the puncture site of intrahepatic bile duct. In that instance the exchange of the polyethylene catheter for a Seldinger catheter became easier when the polyethylene catheter was left in place for 5 to 7 days, irrespective of whether bile came out or not. This problem is met less frequently by using the frontal approach.

Drainage was adequate, in fact a maximum bile volume of 1,400 ml per day was obtained via a catheter, with an inner diameter of 1.22 mm. Inadequate bile outflow was usually due to impaired liver function, to severe dehydration or to infected bile.

Which approach should be preferred to insert the polyethylene catheter to introduce the guide wire in the second step is preferable, the lateral or frontal approach? We prefer the frontal approach using fluorscopic control. If the needle is advance vertically perpendicular to the plane of the x-ray images in the frontal approach, one only needs to vary the depth of the needle in order to hit a previously visualized bile duct.

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